



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF PESTICIDE PROGRAMS

EFED POLICY MEMORANDUM

October 16, 2002

Subject: Automation of Environmental Exposure Concentrations (EECs) and Determinations of Risk Quotients (RQs) for terrestrial plants using TerrPlant Model (version 1.0).

From: Steven Bradbury, Acting Director
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To: EFED Staff and Managers

The Plant Technical Team has recommended implementation of the TerrPlant Model (version 1.0) for determining EECs and RQs for non-endangered and endangered terrestrial plants including wetland species. The model has been developed to automate the existing methods and calculations in deriving exposures and risk quotients to terrestrial plants from various pesticide application scenarios. This model is easy to use and generates results in a fast, efficient and consistent manner.

This model was approved by Plant Tech Team on August 7, 2001 and was provisionally approved by the Science Policy Panel February 11, 2002 pending the confirmation of QA/QC review. Confirmation of QA/QC review was received by the chair of the Science Policy Panel on February 27, 2002. The attached instructions are written based on the QA/QC.

The terrestrial plant EECs are based on the application rate and solubility of the pesticide in water and drift characteristics which depend on ground or aerial applications. The risk quotients are estimated using the toxicity values derived from seedling emergence and/or vegetative vigor studies. The TerrPlant Model (version 1.0) is in agreement with the existing practice for determining plant EECs and RQs for terrestrial plants. The output from this model can be easily incorporated into any risk assessment document (registration or RED documents) or can be attached to the eco-risk assessment document(s).

The TerrPlant model (version 1.0) is in MS Excel and is now ready for use by

everyone in EFED. The model including supporting documents can be found on the F: drive at F:\User\Share\Policies, Guidance, and Formats\EFED Policies\Policies by Topic\Terr Plant Model.

The Plant Tech Team will be providing a demonstration of this model to EFED in the near future. For questions regarding the operation of this model, Santhini Rasmasamy can be contacted at 703-305-8133.

Attachment: Instruction to run the TerrPlant Model

Attachment

Instructions to run the TerrPlant Model

This model estimates the concentrations of pesticide for terrestrial plants (EECs) and determines the plant RQs based on simple assumptions. For detailed information, please read the Introduction and Background sheets in the TerrPlant Excel File.

Before running the program, it is advised the TerrPlant Excel file be copied into another file in order to protect the formulas and formats.

Open the TerrPlant Model in using Microsoft Excel 2000 (or later), select the worksheet named "Nonendangered EEC & RQ".

In the input column, enter the application rate, runoff value, and toxicity data as follows:

- 1) Enter the application rate in lbs/acre.
- 2) Select the runoff value [either 0.01 (<10ppm), 0.02 (10-100 ppm) , or 0.05 (>100 ppm) depending upon the solubility of the chemical].
- 3) Enter the incorporation depth in inches. The default value is one inch for typical ground applications. However, for pesticides that are applied by special incorporation methods (e.g., In-furrow applications, T-banding, Soil injection method etc.), enter the depth of incorporation in inches.
- 4) Enter the Seedling Emergence as well as Vegetative Vigor EC_{25} values for monocots and dicots (lb a.i./Acre).

The program estimates the EECs and calculates the Seeding Emergence and Vegetative Vigor RQs for Nonendangered RQs.

For determining RQs for endangered plants, select the worksheet named "Endangered EECs & RQ", redo the steps 1 through 3 and enter the Seedling Emergence as well as Vegetative Vigor EC_{05} or NOAEC values for monocots and dicots (lb a.i./ Acre) as available in plant DERs.

If the pesticide of interest is granular instead of fine powder or liquid, the program estimates EECs from runoff conditions alone and the toxicity value from Seedling Emergence Study only is considered in calculating RQs. The results are displayed in the lower half of the endangered and non-endangered worksheets.

Exposure to Terrestrial Plants including Wetlands
(August 8, 2001; version 1.0)

Terrestrial plants inhabiting dry and semi-aquatic (wetland) areas may be exposed to pesticides from runoff and/or spray drift. Semi-aquatic areas are low-lying wet areas that may dry up at times throughout the year.

EFED's runoff scenario is

- (1) based on a pesticide's water solubility and the amount of pesticide present on the soil surface and its top one inch,
- (2) characterized as "sheet runoff" (one treated acre to an adjacent acre) for dry areas,
- (3) characterized as "channel runoff" (10 acres to a distant low-lying acre) for semi-aquatic or wetland areas, and
- (4) based on percent runoff values of 0.01, 0.02, and 0.05 for water solubilities of <10, 10-100, and <100 ppm, respectively.

EFED's Spray Drift scenario is assumed as

- (1) 1% for ground application, and (2) 5% for aerial, airblast, forced air, and spray chemigation applications.
- The spray drift ratio used here is in agreement with the policy procedures at the time the worksheet was designed.

Currently, 1) this worksheet is designed to derive the plant exposure concentrations from a single, maximum application rate only. 2) For pesticide applications with incorporation of depth of less than 1 inch, the total loading EECs derived for the incorporation method will be same as the unincorporated method.

To calculate RQ values for Non-Endangered Terrestrial Plants:

Terrestrial Plants Inhabiting Areas Adjacent to Treatment Site:

Emergence RQ = Total Loading to Adjacent Area or EEC/Seedling Emergence EC25
Drift RQ = Drift EEC/Vegetative Vigor EC25

Terrestrial Plants Inhabiting Semi-aquatic Areas Adjacent to Treatment Site:

Emergence RQ = Total Loading to Semi-aquatic Area or EEC/Seedling Emergence EC25
Drift RQ = Drift EEC/Vegetative Vigor EC25

To calculate RQ values for Endangered Terrestrial Plants:

Endangered Terrestrial Plants Inhabiting Areas Adjacent to Treatment Site:

Emergence RQ = Total Loading to Adjacent Area or EEC/Seedling Emergence EC05
or NOAEC
Drift RQ = Drift EEC/Vegetative Vigor EC05 or NOAEC

Endangered Terrestrial Plants Inhabiting Semiaquatic Areas Near Treatment Site:

Emergence RQ = Total Loading to Semiaquatic Area or EEC/Seedling Emergence EC05
or NOAEC
Drift RQ = Drift EEC/Vegetative Vigor EC05 or NOAEC

Formulas used to calculate EEC values (8/08/01; version 1.0)

To calculate EECs for terrestrial plants inhabiting **in areas adjacent** to treatment sites

Un-incorporated Ground Application (Non-granular):

Sheet Runoff = Application Rate (lb ai/A) x Runoff Value

Drift = Application Rate (lb ai/A) x 0.01

Total Loading = EEC = Sheet Runoff + Drift

Incorporated Ground Application with Drift (Non-granular):

Sheet Runoff = [Application Rate (lb ai/A)/Incorporation Depth (inch)] x Runoff Value

Drift = Application Rate (lb ai/A) x 0.01

Total Loading = EEC = Sheet Runoff + Drift

Un-incorporated Ground Application (Granular):

Sheet Runoff = EEC = Application Rate (lb ai/A) x Runoff Value

Incorporated Ground Application without Drift (Granular):

Sheet Runoff = EEC = [Application Rate (lb ai/A)/Incorporation Depth (inch)]
x Runoff Value

Aerial/Airblast/Spray Chemigation Applications:

Sheet Runoff = Application Rate (lb ai/A) x Runoff Value x Application Efficiency of 0.6

Drift = Application Rate (lb ai/A) x 0.05

Total Loading = EEC = Sheet Runoff + Drift

Runoff Value = 0.01, 0.02, or 0.05 when the solubility of the chemical is <10 ppm, 10-100 ppm, or
>100 ppm, respectively

Incorporation Depth: Use the minimum incorporation depth reported on the label.

Formulas used to calculate EEC values

To calculate EECs for terrestrial plants inhabiting **semi-aquatic low-lying areas** near treatment sites:

Un-incorporated Ground Application (Non-granular):

$$\begin{aligned}\text{Channelized Runoff} &= \text{Application Rate (lb ai/A)} \times \text{Runoff Value} \times \text{Factor 10} \\ \text{Drift} &= \text{Application Rate (lb ai/A)} \times 0.01 \\ \text{Total Loading} = \text{EEC} &= \text{Channelized Runoff} + \text{Drift}\end{aligned}$$

Incorporated Ground Application with Drift (Non-granular):

$$\begin{aligned}\text{Channelized Runoff} &= [\text{Application Rate (lb ai/A)} / \text{Incorporation Depth (inch)}] \\ &\quad \times \text{Runoff Value} \times \text{Factor 10} \\ \text{Drift} &= \text{Application Rate (lb ai/A)} \times 0.01 \\ \text{Total Loading} = \text{EEC} &= \text{Channelized Runoff} + \text{Drift}\end{aligned}$$

Un-incorporated Ground Application (Granular):

$$\text{Channelized Runoff} = \text{EEC} = \text{Application Rate (lb ai/A)} \times \text{Runoff Value} \times \text{Factor 10}$$

Incorporated Ground Application without Drift (Granular):

$$\begin{aligned}\text{Channelized Runoff} = \text{EEC} &= [\text{Application Rate (lb ai/A)} / \text{Incorporation Depth (inch)}] \\ &\quad \times \text{Runoff Value} \times \text{Factor 10}\end{aligned}$$

Aerial/Airblast/Spray Chemigation Applications:

$$\begin{aligned}\text{Channelized Runoff} &= \text{Application Rate (lb ai/A)} \times \text{Runoff Value} \\ &\quad \times \text{Application Efficiency of 0.6} \times \text{Factor 10} \\ \text{Drift} &= \text{Application Rate (lb ai/A)} \times 0.05 \\ \text{Total Loading} = \text{EEC} &= \text{Channelized Runoff} + \text{Drift}\end{aligned}$$

Runoff Value = 0.01, 0.02, or 0.05 when the solubility of the chemical is <10 ppm, 10-100 ppm, or >100 ppm, respectively

Factor 10 represents 10 treated acres per acre of low-lying area

Incorporation Depth: Use the minimum incorporation depth reported on the label.